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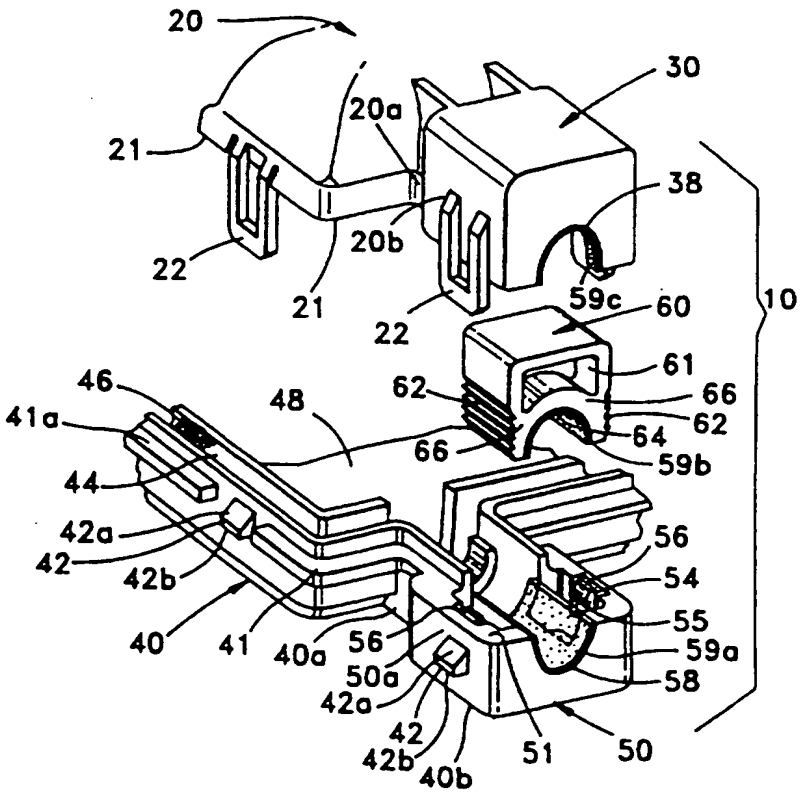
(54) Title: PROTECTIVE COVER FOR ELECTRICAL CONNECTORS

(57) Abstract

A protective cover assembly (10) for electrical connectors is disclosed having a cover (20) with body cable passages (50). A spacer latch component (60) is operatively disposed in the passages (50) for latching electrical cables (12, 14) to the assembly (10). Sealant grease (46) is disposed in a channel (44) of the body (40) for sealing between the cover (20) and the body (40). Sealing and dielectric compound pads (59a, 59b) are disposed adjacent to the spacer latch component (60) and body cable passage (50). The protective cover assembly (10) thus provides protection against moisture and other contaminants which would tend to cause corrosion and failure of the electrical connector.



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PROTECTIVE COVER FOR ELECTRICAL CONNECTORS

The present invention relates to a sealed, protective cover for electrical connectors, particularly covers for use in electrical power distribution systems.

It is desirable to protect electrical connectors from dirt, moisture, and other contaminants in order to prevent corrosion and failure of the connector. Toward this end, covers have been developed which seal the connector inside a protective cover. Such covers, for example, have been made with clam shell halves having snap-fit type latches for holding the halves together. However, of particular importance to such covers is a good seal at the cable passage or port of the cover, and, moreover, an ability of the cable passage or port to accommodate various sizes of electrical cable.

An example of a known cable connector cover is disclosed in US-A-4229616, which known device provides a cover including two clam shell halves which snap together. A cable port through the joined halves requires a slidable door having latching teeth thereon which cooperate with latching teeth on walls of the cover halves. The door is slidable in grooves in the housing walls and the teeth on the door and walls cooperate to retain the door in a given position. Since the door further includes an arcuate cable interface member defining a semi-circular edge of the cable port, the sliding of the door to a given position provides an adjustable cable port diameter for the purpose of accommodating various cable sizes.

However, when subjected to external forces, the structural arrangement of the teeth and the door itself may result in a loosening of the door and loose fit of the cable through the port. Moreover, the ability of the known cover to resist moisture and other contaminants is partly dependent on flanges on the respective halves being snugly joined, but as the flanges are subject to geometrical and material

variations due to manufacturing tolerances, the flanges may not maintain a hermetic seal, thereby permitting undesirable foreign matter to enter into the cover housing. Moreover, the flanges are not designed to accommodate a sealing grease. Additionally, the known connector is drawn to indoor telecommunications use, and is not particularly suited for the rigorous demands of the outdoor electrical power distribution environment.

The present invention offers a solution to all of the above problems by providing a cable connector cover that provides a reliable, tight fit around cables, provides a hermetically sealed cover assembly suitable for use in indoor or outdoor environments, and yet is easy to install and manufacture.

A preferred embodiment of the present invention provides a protective cover assembly having a top cover half and matable body half. Each half includes a cable port or passage for sealingly engaging an electrical cable. Further, the matable halves are shaped to receive an electrical connector therein which electrically connects the cables. The cover half of the cover includes deflectable tabs which are snap-latchable to camming lugs on the body half. Prior to joining the matable halves together, a sealant grease is deposited in a groove space and along edges of the halves for hermetic sealing of the halves when joined. The cable passage in the body half includes an integral platform member for supporting the cable, and a pair of deflectable latch arms having pawls thereon. A separate spacer latch component is sized to fit in the body and cable passages when they are joined together. Ratchets are operatively disposed on sides of the spacer latch component for engagement with the pawls in the body cable passage. A sealing and dielectric compound in the form of pads is placed on the platforms of the body half, an arch portion of the cover half, and an arch portion of the spacer latch component. The spacer latch

component is positioned over a cable and is then depressed and ratcheted into a locking position around the cable. At this point, the sealing and dielectric compound is spread around in the cable port or passage thereby sealing around the cable. The cover half is then placed over the spacer latch component and the tabs on the cover are fully engaged by the lugs on the body half for snugly and sealingly joining the halves together. Additionally, double-lock members formed on the cover wedge between latch arms on the cover and a portion of the body thereby assisting to hold the latch arms in place.

Another embodiment of the present invention provides a top cover half and a matable body half wherein each half includes a double-lock member and a resilient latching arm. Yet another embodiment of the present invention provides a top cover half and a matable body half wherein ratchets are formed on the matable body half for engaging a resilient latching arm formed on the spacer latch component.

It is an object of the present invention to provide a protective cover for electrical connectors for use in both indoor and outdoor environments.

It is a further object of the invention to provide a protective cover for electrical connectors which reliably seals cables of various sizes.

It is yet a further object of the invention to provide a protective cover for electrical connectors that is hermetically sealed and prevents contaminants from damaging the electrical connector within.

It is another object of the invention to provide a protective cover for electrical connectors which is of low production cost, and is easy to manufacture and assemble.

Figure 1 is an exploded perspective view of a protective cover assembly according to the present invention.

Figure 2 is a plan view of an electrical connector disposed in the lower half of the protective cover of Figure 1.

Figure 3 is a cross-sectional elevational view showing an electrical cable disposed in the protective cover of Figure 1 when the cover half, spacer latch component, and body half are in an assembled state.

Figure 4 is a an enlarged cross-sectional view showing an electrical cable disposed in the protective cover of Figure 1 when the cover half, spacer latch component, and body half are in an assembled state.

Figure 5 is a an enlarged cross-sectional view of a second embodiment of the present invention showing an electrical cable disposed in the protective cover when the cover half, spacer latch component, and body half are in an assembled state.

Figure 6 is a an enlarged cross-sectional view of a third embodiment of the present invention showing an electrical cable disposed in the protective cover when the cover half, spacer latch component, and body half are in an assembled state.

Figure 1 shows an exploded view of the protective cover assembly 10 accordingly to the present invention which includes a cover 20, body 40, and a spacer latch component 60. The cover assembly 10 is preferably formed of a suitable plastic or other dielectric material and includes cover flange 21, a cover cable passage 30, and resiliently deflectable tabs 22 for latching to lugs 42 of body 40, as is further described hereinbelow. The cable passage 30 is formed in a general box shape, includes a cable arch 38 adapted to fit around cables 12,14, and is adapted to receive the spacer latch component 60 therein. The cable arch

portion 38 includes a sealing and dielectric pad 59c for sealing around cables 12,14 and cable passage 30.

Referring to Fig. 2, in a preferred embodiment, the cover 30 has three cover cable passages, two for the run conductor 12 and one for a top conductor 14, the conductors being joined by conventional electrical connector 16 which includes a C-shaped member with a wedge. As best shown in Fig. 4, the cover 30 further includes double-lock members 32 formed thereon for fitting into a tapered groove 56 on body 40, which will be further described below.

The body 40 includes stop flange 41 having a top surface 41a, latching lugs 42, a channel 44 for receiving sealant grease, a sealant grease 46, and body cavity 48. The body 40 further includes a neck portion 40a and a head portion 40b for defining a body cable passage 50. The body cable passage 50 has a top surface 51, a platform 52 (best shown in Fig. 3), resilient latch arms 54 having pawls 55, tapered groove 56, and cable support surface 58. Sealing and dielectric compound pad 59a is placed on the platform 52 in preparation for sealing of the cable passages 30,50. Lugs 42 include a ramp surface 42a for resiliently deflecting the tabs 22 of cover 20 when the cover 20 is joined to the body 40, and the lugs 42 further include a flange 42b for locking the tabs 22 in place. Flange 21 of cover 20 will engage stop flange 41 when the halves 20,40 are joined together. Additionally, cover 20 includes a neck portion 20a and a head portion 20b for forming the cover cable passage 30. Referring again to Figure 2, channel 44 is adapted to accommodate the disposition of a conventional sealing grease 46 therein for the purpose of hermetically sealing the protective cover assembly 10 when it is in the fully assembled state, as further described below.

Referring to Figures 1 and 3, the body cable passage 50 will now be described. Body cable passage 50

includes cable platform 52, side walls 50a, and bottom wall 50b. As is best shown in Figure 3, platform 52 supports the conductors 12,14 in cooperation with cable support surface 58 and legs 52a, which legs are connected to bottom wall 50b. On the inside of body cable passage 50 are integrally molded, resilient latching arms 54 having pawls 55 which are operatively arranged for engagement with ratchets 62, as further described below. The resilient latching arms 54 are disposed in tapered grooves 56 for the purpose of providing room for flexibility and protection thereof. Cable support surface 58 is generally semi-cylindrical in shape, and has an axial direction which is aligned to lead the cables 12,14 into body cavity 48 across sealing groove 44. In a plane generally transverse to the axial direction of cable support surface 58, the lugs 42 are arranged and formed on sidewalls 50a. In the preferred embodiment, the tapered groove 56, double-lock members 32, and latching arms 54 are also generally arranged in this plane, which provides an advantageous overall cable gripping arrangement as further described below.

Referring now to Figures 1 and 3, the spacer latch component 60 will be further described in detail. Spacer latch component 60 is generally box-shaped and includes legs 66 having ratchets 62 disposed on lateral sides thereof, a hollow portion 61, and a cable gripping and sealing arch portion 64. Sealing and dielectric compound pad 59b is placed on the sealing arch portion in preparation for sealing of the cable passages 30,50. The shape of spacer latch component 60 is adapted to fit within both the cover cable passage 30 and the body cable passage 50 when matable halves 20,40 are fully joined. Ratchets 62 are operatively disposed on legs 66 for latching engagement with pawls 55 during assembly of the protective cover assembly 10.

Referring again to Fig. 4, an enlarged cross-section of the invention in the assembled state,

according to the preferred embodiment, is shown. Double-lock members 32 are formed in a general wedge shape, which shape is complimentary to that of the tapered groove 56. When the cover 30, spacer latch component 60, and body 40 are in an assembled state, the double-lock members 32 are disposed adjacent to the latch arms 54 for maintaining the position of the latch arms 54. Thus, the latch arms 54 are not completely free to deflect back into tapered grooves 56, and thereby loosen the spacer latch component 60, because double-lock members 32 advantageously stop them from doing so. This feature tends to maintain the tight grip that the spacer latch components 60 have on the cables 12,14 by assuring that the latch arms 54 will not inadvertently deflect in response to forces acting on the cables 12,14 and/or protective cover assembly 10. When the spacer latch component 60 is fully assembled to the body half 40, the sealing and dielectric compound pads 59a,59b are depressed and the compound is spread around the cable and cable passages 30,50, thereby sealing the same as is shown in Figure 4.

Having thus described a preferred embodiment of the present invention, the embodiments of Figures 5 and 6 will now be described. The embodiments of Figures 5 and 6 are similar to that of Figures 1-4 so that an re-explanation of the features which are common to all of the embodiments is not necessary for a complete understanding of the invention. Figure 5 shows a protective cover assembly 10' including cover half 20', body half 40', and spacer latch component 60'. However, the orientation of double-lock member 32', latching arm 54' with pawls 55', groove 56', and ratchets 62' on one side of the protective cover assembly 10' represents a 180 degree rotation relative to the orientation of double-lock member 32, latching arm 54 with pawls 55, groove 56, and ratchets 62 on the other side of spacer latch component 60'. Since the embodiment of Figure 5

includes double-lock members 32,32', it advantageously provides double locking of the latch arms 54,54' for assured retention of the spacer latch component 60' and cables 12,14. When the spacer latch component 60' is fully assembled to the body half 40', the sealing and dielectric compound pads 59a',59b' are depressed and the compound is spread around the cable and cable passages, thereby sealing the same as is shown in Figure 5.

Referring now to Figure 6, a third embodiment 10'' of the protective cover assembly will be described. Protective cover assembly 10'' includes a cover half 30'', body half 50'', and spacer latch component 60''. Resilient latching arms 54'' with pawls 55'' are formed on spacer latch component 60'' adjacent to grooves 56'' and resilient tongue members 68. Ratchets 62'' are formed on the body half 50'' for engaging pawls 55'' which thereby hold the spacer latch component 60'' tightly against cables 12,14. The resilient tongue members 68 resiliently engage the cables 12,14 for a snug fit therebetween. When the spacer latch component 60'' is fully assembled to the body half 40'', the sealing and dielectric compound pads 59a'',59b'' are depressed and the compound is spread around the cable and cable passages, thereby sealing the same as is shown in Figure 6.

Assembly and operation of the connector assembly 10 accordingly to the preferred embodiment of Figures 1-4 will now be described with reference to the drawing Figures and the foregoing description; however, it is understood that the embodiments of Figures 5 and 6 can be assembled in a like fashion. First, a run conductor 12 is joined to a tap conductor 14, for example, by an electrical connector 16 as shown in Fig.2. The operator deposits a liberal amount of grease sealant 46 in the channel 44, put the body 40 on the cables 12,14 and electrical connector 16 as shown in Figure 2, and then push the spacer latch components 60 into their

respective places in body cable passages 50, thereby attaching the body 40 to cables 12,14. As each spacer latch component 60 is pushed into place, the ratchets 62 displace pawls 55 causing resilient latch arms 54 to deflect into tapered grooves 56, as needed for flexibility. As each individual ratchet 62 passes the pawls 55, the latching arms 54 flexibly oscillate in tapered groove 56 until the spacer latch component 60 is seated against cable 12 or 14. Because tabs 22, lugs 42, latching arms 54, pawls 55, and ratchets 62 are generally arranged in a plane which is generally transverse to a longitudinal axis of the cable 12 or 14 as noted above, a reliable mechanical joint is formed. The retaining forces of the tabs 22, lugs 42, ratchets 62, and pawls 55 are thereby aligned to grip the cables 12,14. Additionally, because ratchets 62 run the length of legs 66 and thereby provide a better grip for pawls 55, the pawls 55 are not likely to be forced into retraction by slipping off of the ratchets 62 due to external forces acting on the cables 12,14. Furthermore, the resiliency of the latching arms 54 provides ease of assembly. A yet further advantage is that the spacer latch component 60 can accommodate different cable sizes because the interaction of the ratchets 62 and pawls 55 make the cable opening adjustable. A further advantage of the present invention is that when the spacer latch component 60 is fully assembled to the body half 40 and cover 20 is installed thereover, the sealing and dielectric compound pads 59a,59b,59c are depressed and the compound is spread around the cable and cable passages 30,50, thereby sealing the same. The cable 12 or 14 is thus snugly and sealingly disposed between cable gripping arch 64, and support surface 58. Next, sealant 46 is generally applied to each body passage 50 and then the operator will place cover 20 on body 40 so that the resilient tabs 22 are cammed outwardly as they slide

over ramps 42a until the tabs lock against flanges 42, and cover arch portion 38 with sealing and dielectric pad 59c is sealingly disposed against cables 12,14. The cover flange 21 is thereby tightly seated against body flange 41. Since sealant grease 46 is disposed along the underside of cover 20, a hermetic sealing gasket is thereby formed around a seam where the cover 20 and body 40 are juxtaposed. Additionally, as explained above, the disposition of the double-lock members 32 in tapered grooves 56 tends to maintain the tight grip that the spacer latch components 60 have on the cables 12,14 by assuring that the latch arms 54 will not inadvertently deflect in response to forces acting on the cables 12,14 and/or protective cover assembly 10. The embodiments of Figures 5-6 are assembled and operate substantially the same as the foregoing description of the preferred embodiment.

Three embodiments of a protective cover suitable for indoor or outdoor use have thus been disclosed; however, modification of the invention can be made without departing from the spirit of the invention or the scope of the appended claims. For example, the spacer latch component can be adapted for use with more or less than three cables per assembly. Additionally, although the preferred embodiment discloses a utility-type connector, it is understood that the protective cover assembly can be adapted for use with any shape connector for any electrical or electronic application, e.g. telecommunications, automotive, coax, fiber optics, etc. Moreover, it is understood that the protective cover assembly can be formed of materials other than plastic, e.g. a laminate or metal coated with insulative material. Furthermore, the spacer latch component 60 can be modified to include the latch arms 54 and pawls 55, while the passage 50 would be modified to have ratchets 62 formed thereon. Thus, while several embodiments of the present invention have been described

with reference to the drawing figures, it is to be understood by persons of ordinary skill in the art that the invention is not to be strictly limited to such embodiments, but may be otherwise variously embodied and practiced within the scope of the following claims.

Accordingly, what is claimed is:

1. A protective cover assembly for use with at least one electrical conductor connected to an electrical connector, comprising a cover assembly half and a body assembly half, said assembly halves being adapted to sealingly fit around said electrical connector and conductor; said cover assembly half and body assembly half each include at least one conductor passage, said protective cover assembly characterized in that: at least one spacer latch component is operatively disposed between said assembly halves for gripping and sealing said at least one conductor.

2. The cover assembly of claim 1, wherein one of said assembly halves includes a platform formed thereon comprising a cable support surface and at least one upright leg supporting a cable support surface.

3. The cover assembly of claim 1, wherein at least one of said assembly halves includes a resilient latching arm for engaging the spacer latch component.

4. The cover assembly of claim 3, wherein the spacer latch component includes ratchet surfaces on a side thereof for deflecting the resilient latching arm of said at least one assembly half.

5. The cover assembly of claim 3, wherein the resilient latching arm is disposed adjacent to a groove formed in said at least one assembly half whereby, upon engaging the spacer latch component, the resilient latching arm is deflected towards said groove.

6. The cover assembly of claim 1, wherein said assembly halves have sides formed thereon, and a narrowed neck portion and a head portion are formed on said sides, and wherein said neck and head portions extend relatively away from said sides for defining said conductor passages.

7. The cover assembly of claim 1, wherein at least one of said assembly halves includes a groove

along the periphery thereof for receipt of a sealant material therein.

8. The cover assembly of claim 7, wherein the groove has a longitudinal axis generally along said periphery, and said at least one conductor passage of said assembly halves has an axial direction which is generally transverse to said groove longitudinal axis where said groove is adjacent to said passage, whereby said sealant material is arranged for sealing contact with said at least one conductor.

9. The cover assembly of claim 1, wherein at least one of said assembly halves includes a stop flange formed thereon, which stop flange is disposed generally along the periphery of said assembly half, said stop flange having at least a pair of ends.

10. The cover assembly of claim 9, wherein said assembly further includes a latching tab and a lug for latchably engaging said latching tab when said assembly halves are joined, and wherein said latching tab and said lug are located between said stop flange ends when the assembly halves are so joined.

11. The cover assembly of claim 9, wherein said stop flange includes a top surface which is generally co-planar with a top surface of at least one of said conductor passages.

12. The cover assembly of claim 1, wherein one of said assembly halves includes double-lock members formed thereon for disposition in complimentary tapered grooves formed in the other of said assembly halves.

13. The cover assembly of claim 1, wherein at least one of said cover and body assembly halves include a latching tab, and the other of said cover and body assembly halves includes a lug for latching with said tab when said assembly halves are joined together.

14. The cover assembly of claim 1, wherein said spacer latch component includes a resilient latching arm for engaging one of said assembly halves.

15. The cover assembly of claim 14, wherein one of said assembly halves includes ratchet surfaces formed on a side thereof for deflecting the resilient latching arm of said spacer latch component.

16. The cover assembly of claim 14, wherein the resilient latching arm is disposed adjacent to a groove formed in said spacer latch component whereby, upon engaging the assembly half, the resilient latching arm is deflected towards said groove.

17. The cover assembly of claim 1, wherein each of said assembly halves includes at least one double-lock member formed thereon for disposition in a complimentary tapered groove formed in the other of said assembly halves.

18. The cover assembly of claim 1, wherein said spacer latch component and said body half each include a sealing and dielectric compound pad for sealing said conductor and conductor passages.

19. The cover assembly of claim 18, wherein the cover half includes a sealing and dielectric compound pad for sealing said conductor and conductor passages.

Fig. 1

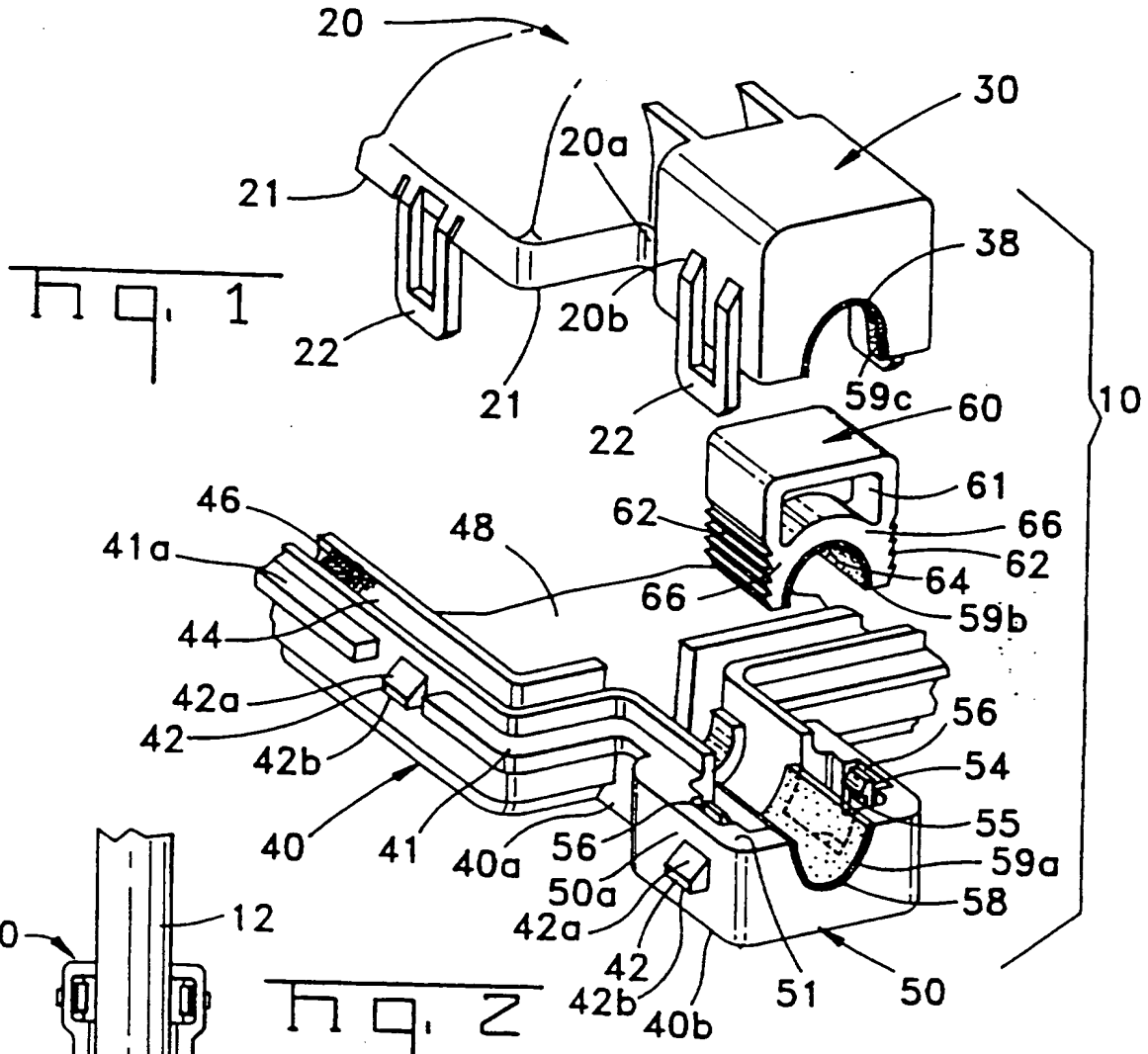


Fig. 2

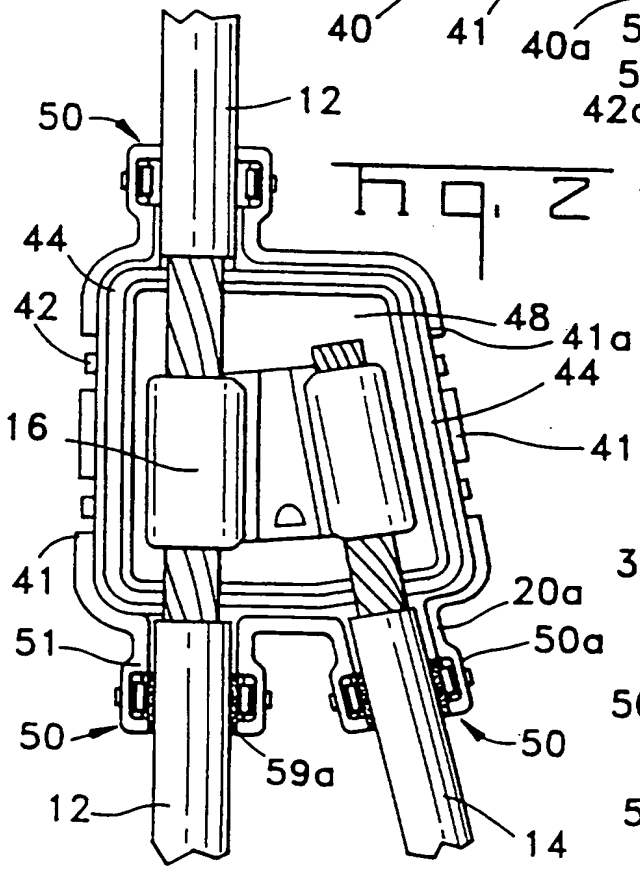
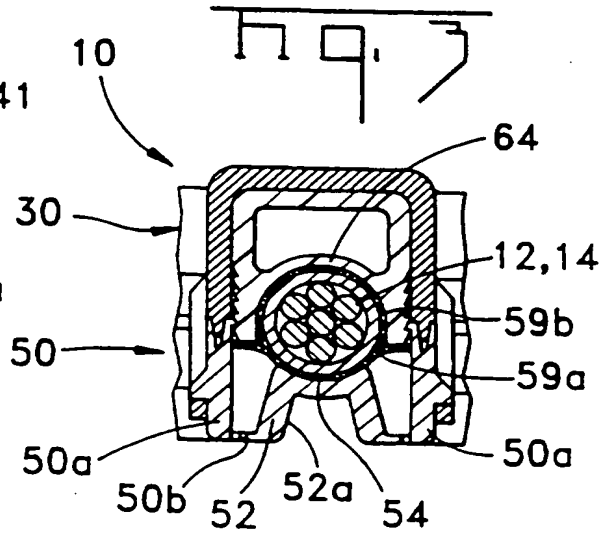


Fig. 3



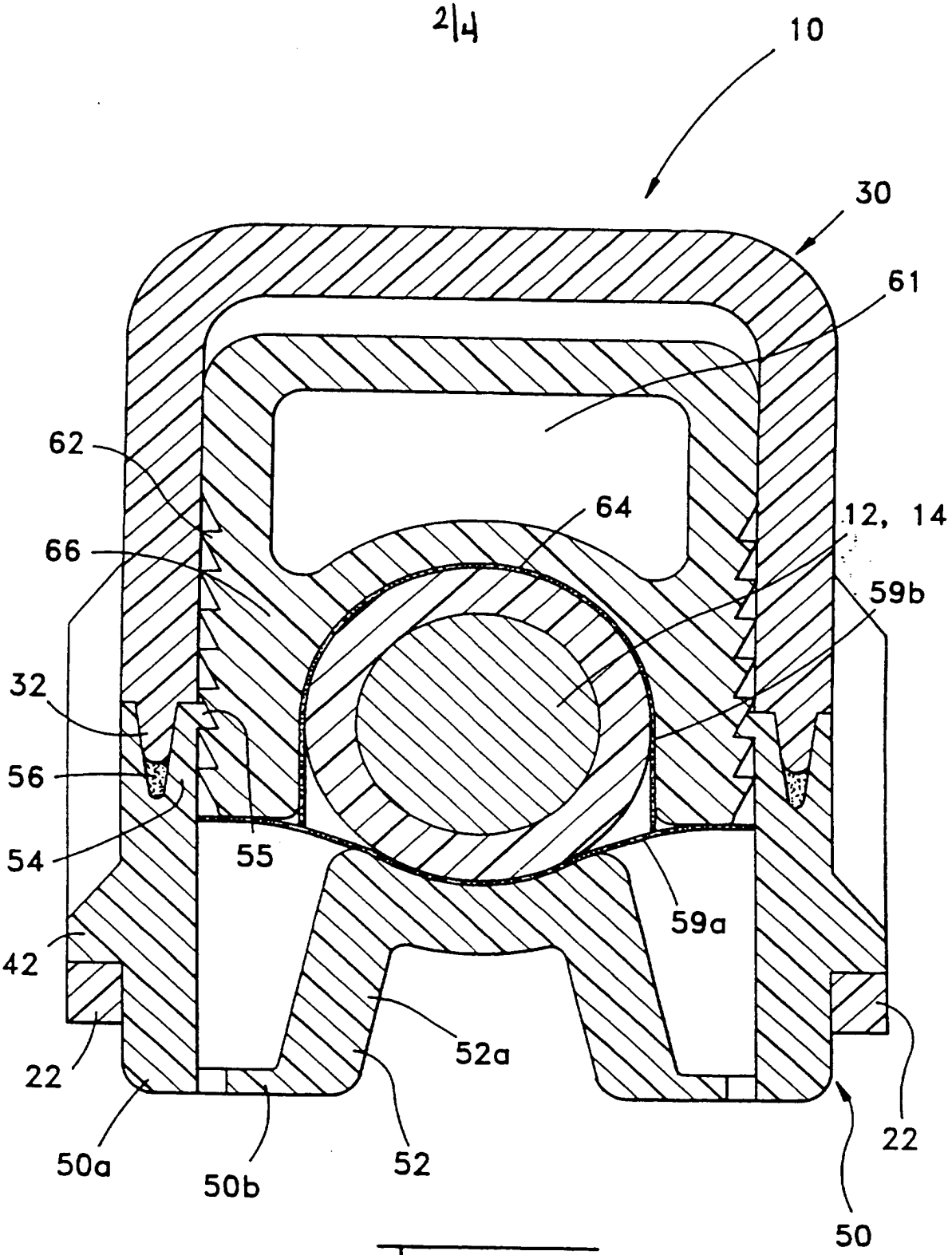


Fig. 4

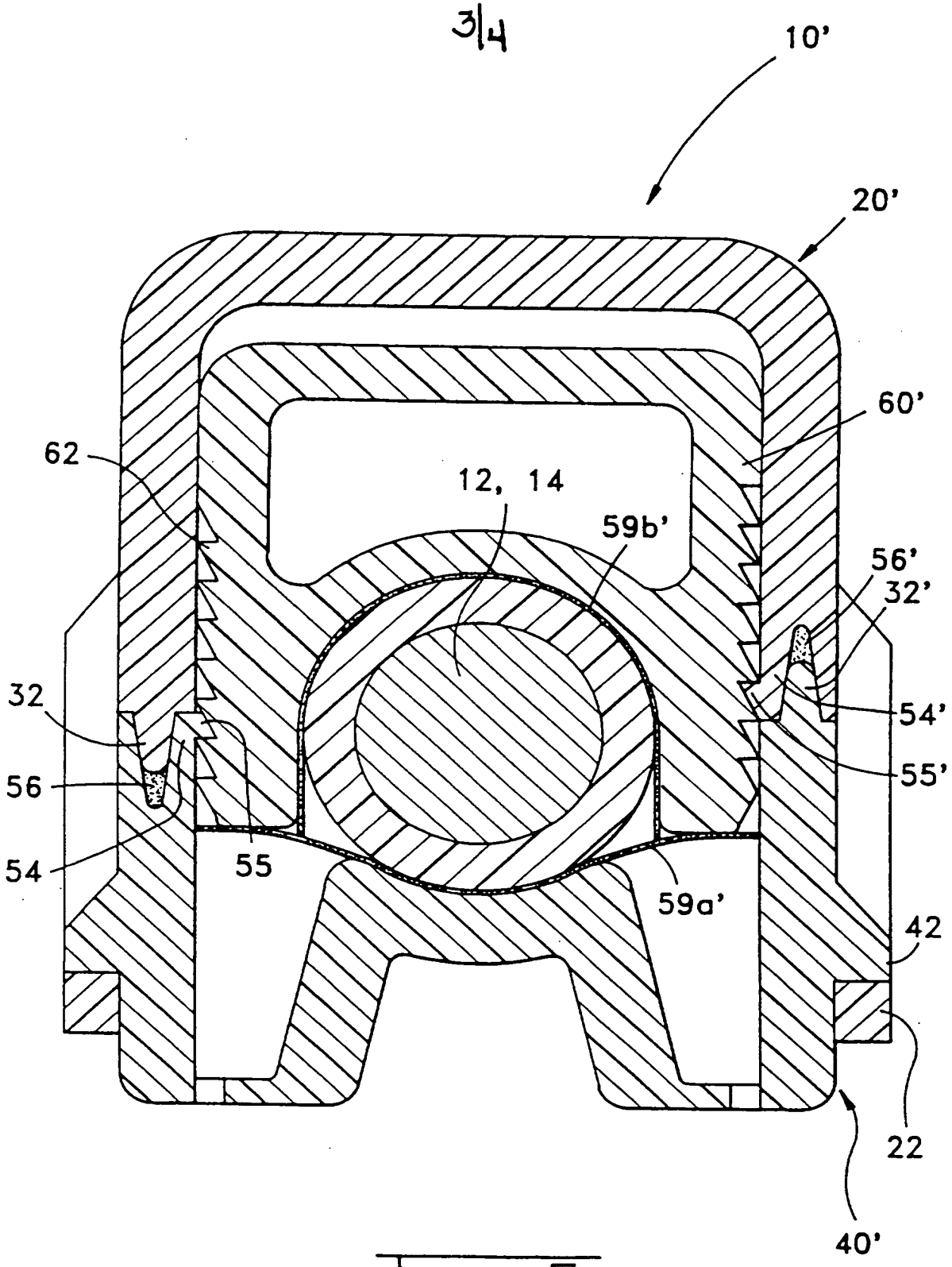


Fig. 5

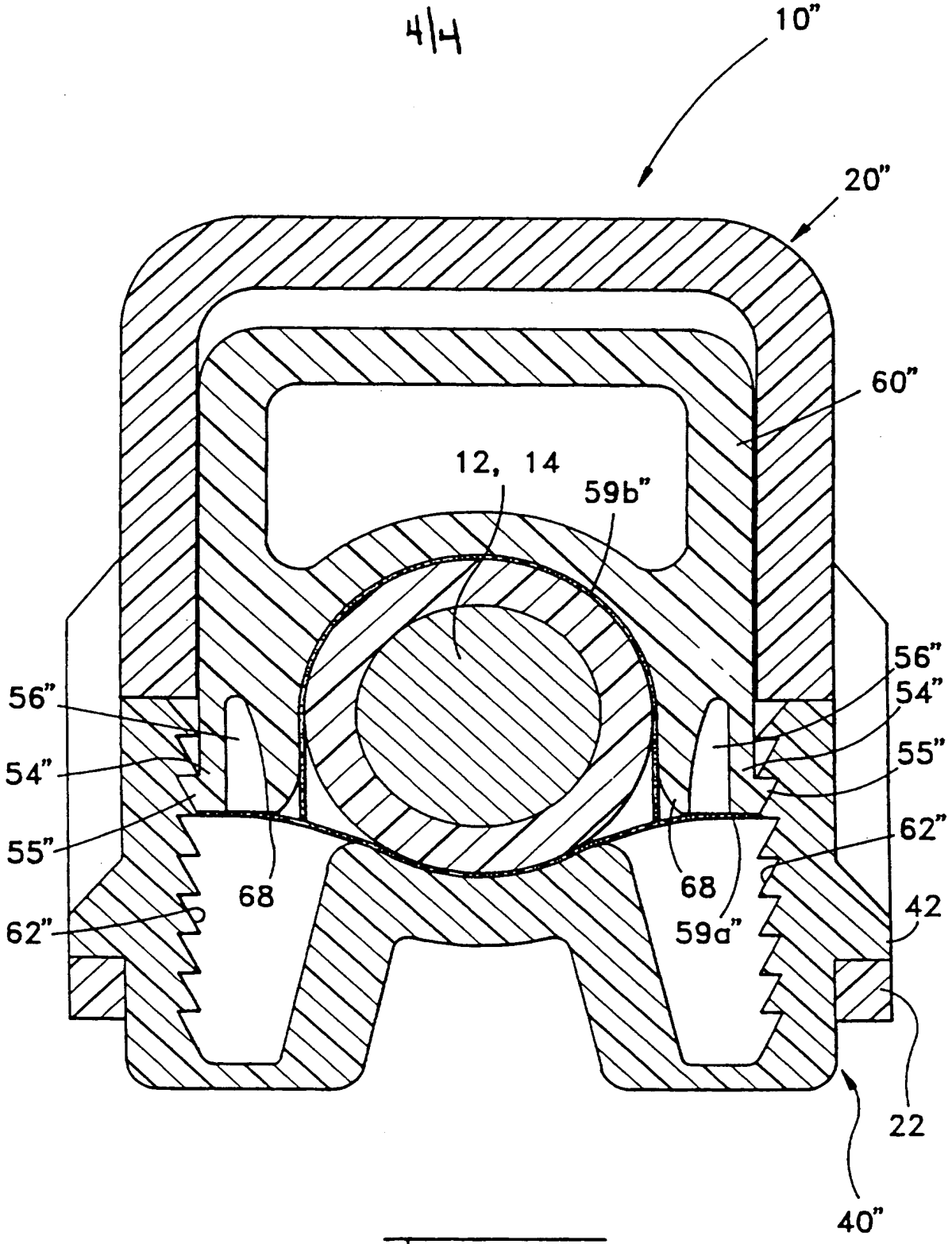


Fig. 6

INTERNATIONAL SEARCH REPORT

Int onal Application No
PCT/US 95/09835

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H01R13/52 H01R13/58

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,4 229 616 (KENNETH HOTCHKISS) 21 October 1980 cited in the application see column 3, line 28 - column 4, line 19	1
A	see column 5, line 24-46; figures 1,4	6,7

Y	US,A,4 398 781 (AMF INCORPORATED) 16 August 1983	1
A	see column 1, line 20-34 - column 2, line 7-46 see figure 1	6,7,18, 19

A	US,A,4 749 369 (SHUN H. WAND) 7 June 1988 see column 1, line 54 - column 2, line 57; figure 3	1,3,4,9, 10,13-15

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
23 November 1995	08. 12. 95

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 130 330 (AMP INCORPORATED) 19 December 1978 see claim 1; figures 1,9 ---	1-4,9, 14,15
A	US,A,4 108 527 (AMP INCORPORATED) 22 August 1978 see figure 1 ---	1,13
A	FR,E,93 122 (PIERRE HURAULT) 14 February 1969 see figure 5 -----	12

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INTERNATIONAL SEARCH REPORT

...information on patent family members

Inte: ...nal Application No
PCT/US 95/09835

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		JP-B-	61048221	23-10-86
		NL-A-	7805911	28-12-78
		SE-B-	432852	16-04-84
		SE-A-	7807121	24-12-78
FR-E-93122	14-02-69	NONE		